Town of Amherst,
Massachusetts

Build-Out Analysis and Future Growth Study

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Report Contents

1.0 BUILD-OUT INTRODUCTION

In recent years a flurry of build-out analysis activity has taken place in the Commonwealth of Massachusetts. Beginning in 1998 the Massachusetts Executive Office of Environmental Affairs (EOEA) and MassGIS produced build-out analyses for all 351 Massachusetts municipalities as part of the ongoing Community Preservation Initiative. These analyses were performed by regional planning associations (RPAs) in collaboration with EOEA and town planners or private planning firms. Geographic information system (GIS) technology was used extensively for mapping and analysis. The process utilized standard, statewide geographic data to quantify existing developable land within Massachusetts communities. It also provided projections regarding future population, pollution and various resource loads.

The Town of Amherst was one of the first municipalities completed in this process, with the actual analysis performed by the Pioneer Valley Planning Commission (PVPC) in 1999. The quality of the analysis was high, but at the time the most current and accurate data sources weren't available, the methodology had yet to be fully standardized, and PVPC didn't have the benefits of the full set of tools that augmented and streamlined the process in its later stages. Additionally, the scope and schedule of the project didn't allow for sufficient interaction with town officials, committee members and citizens to incorporate essential local input and expertise.

In 2001Amherst undertook to update and augment their EOEA build-out with newly acquired, high quality planimetric and parcels data. These datasets had been acquired by the Town subsequent to the initial analysis and represent a vast improvement over standard, statewide layers.

Applied Geographics, Inc. (AGI) and Philp B. Herr & Associates (Herr) were contracted to extend the existing build-out making full use of these higher accuracy data sets, to perform more in-depth analysis regarding historic and projected rates of development, as well as to facilitate public participation in a visioning process that would encourage multi-party input in the creation of hypothetical future development alternatives.

AGI/Herr refined and extended the original MassGIS/EOEA methodology in important ways. These included:

- Increasing the amount and specificity of input from local officials, committee members and the general public
- Maintaining extensive outreach and data access through hosting of a web site to distribute spatial data, calculation tables and build-out bulletins, and maintaining phone and email contact with the full list of project participants
- Loading of GIS data and growth assumptions into a model that permitted iterative manipulation of assumptions to more carefully evaluate and tune output totals and projected resource loads
- Performing detailed analysis of historical housing inventories, open space acquisitions and population trends

Over a six-month period AGI/Herr collected base data and tuned the evolving build-out model. These activities included assembling and co-registering different data layers from the Town, from other consultants to Amherst, from MassGIS and the U.S. Census. Using Amherst's high quality orthophotography, interpretations were made to extract different features describing currently developed land into the constraints layer structure. Working sessions were held with Amherst officials to establish accurate numerical assumptions for demographics and current resource consumption, and to integrate new data sources to maximize process accuracy.

Because a build-out benefits enormously by increased public participation, the process included members of the Amherst Planning Board and Comprehensive Plan Committee as well as representatives from the local real estate industry, from Amherst's colleges and the University of Massachusetts, advocates for affordable housing and increased open space, and a large number of private citizens with an intimate knowledge of the Town and a passion to properly plan for its future.

This process culminated in a workshop held on Saturday May 11, 2002 at the Amherst High School. The participants who attended this workshop were briefed on the project methodology, introduced to preliminary findings and invited to actively participate in evaluation of future development scenarios. These alternatives are:

- Base amount of growth, with pattern following current trends (such as including gradual addtions to open space).
- Lowered amount of growth, following current pattern trends.
- Lowered growth, strongly directed to the Center of town.
- Lowered growth, strongly directed to three new village centers

Each was plotted on a large format sheet (6' x 3') and laid out on a table for detailed inspection. The participants at each table were attended by a scenario leader and technical staff person with a dedicated laptop to clarify uncertainties of process or content as these arose. All constituents of analysis and map output were available as reference, either on hardcopy output or via a quick query on one of the available computers.

While the four future development alternatives each had merits and adherents, consensus gravitated away from the "current trends extended" scenario and toward the final option of lower growth directed toward village centers. This shared sense of an appropriate pattern for future development represents an important accomplishment, and successful execution of this build-out exercise reaffirms Amherst's tradition of remaining in the forefront of those New England communities actively planning for the future of their landscape and inhabitants.

2.0 GIS ANALYSIS METHODS and RESULTS SUMMARY

Fundamentally, a build-out analysis sets out to determine how much land in a town is available for development, what type of development will be permitted on that land, and how much of it there will ultimately be. This is not a vague prognostication, but a highly technical and carefully controlled process to use defensible numerical inputs to produce dependable outputs.

Traditionally build-out analysis has been very complex and details-laden, and primitive tools have hindered ongoing adjustments to the model. Areas of individual constraints must be painstakingly identified and calculated before development assumptions can be factored into them. If underlying area values change, consequent assumptions are upset and this creates a cascade of necessary adjustments. The Amherst build-out was designed to be repeatable and highly tunable, so that changes in hundreds of details could quickly reflect their consequences throughout the entire model.

The GIS component of the Amherst Build-Out Study was undertaken in two major phases:

- Creation of the accurate baseline model, in which numerous constraints layers, each representing a single overlay characteristic (conservation lands, steep slopes) were aggregated to produce a constraints composite. This composite provided a picture of all buildable land, and was overlaid with an official zoning layer to determine how much development would be permitted by existing regulations in these remaining lands.
- Generation of future development alternatives based on committee input and spatial analysis findings, and calculation of impacts of these alternatives.

Baseline Model

Constraints were assembled primarily from Town of Amherst GIS spatial data sources and augmented by MassGIS and other layers. Many of the Amherst layers were constructed using the highly accurate Amherst digital property parcels as the template. This allowed individual properties meeting certain criteria (i.e., conservation lands) to be extracted for inclusion in the collection of constraints, and allowed highly precise adjustments and alternative scenarios to be tested. For instance, this permitted potential future land acquisitions to be targeted and their impacts assessed accurately.

This process is illustrated in Figure 2.1, where the shaded parcels represent specific Amherst properties that have been identified as protected open space. These are initially identifed from the Assessor's records. Individual shapes on the map are linked to records in assessing tables, allowing for quick and accurate

Figure 2.1: Parcels with Conservation Lands: Shaded areas indicate lands that are restricted from future development due to conservation restrictions

extraction and display. This allows ownership as well as tax status, area and other valuable attributes of individual properties to be used as evaluation criteria.

The list of absolutely constrained layers included flood prone conservancy districts, steep slopes, open water, institutional holdings (college-owned lands) and lands currently developed to zoning limits.

In addition to the absolutely constrained lands, numerous layers representing partial constraints were added to the model. These represent limitations or restrictions to development of a property in some way, but are not absolute. Examples include aquifer recharge areas, moderate slopes, wetlands, Massachusetts River Protection Act 100' buffers, and Farmland Conservation Overlay districts. Partial constraints are fractionally weighted to represent the discounted buildability of the land they encompass. A full list of partial constraints with their development restriction coefficients may be found in Appendix E.

In Figure 2.2 a representative partial constraint, the Amherst Aquifer Protection Recharge overlay is illustrated as hatching in the lower portion of the frame.

AGI/Herr used the GIS to stack all of these layers together to produce total constraints composite, containing all land in the Town of Amherst not eligible for future development. Remaining land is considered developable.

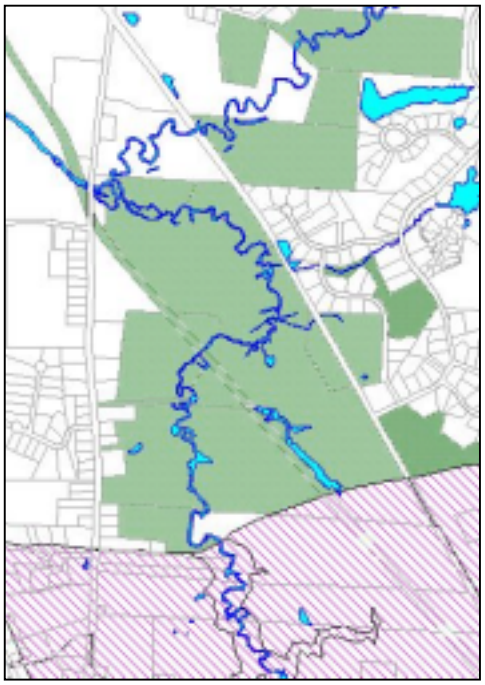


Figure 2.2: Partial Constraints Overlay: Hatching defines area covered by a constraints overlay (aquifer protection recharge area) that does not fully inhibit land from development.

Constrained and Buildable Composites

The results of this process are illustrated in Figures 2.3 and 2.4. In Figure 2.3, the shaded polygons represent areas that are currently ineligible for development. This shaded area is the combined total of all of the colored areas in the individual constraints maps.

Figure 2.4 represents the opposite view, or all areas that are not constrained and may be built upon in the future. Close inspection reveals that figures 2.3 and 2.4 represent exact opposites or complements. Absolute constraints and developable land are mutually exclusive.

This process was undertaken with ongoing collaboration of the Amherst Planning Department and Comprehensive Planning Committee, and alternative assumptions were frequently changed and

evolved considerably before arrival at an agreeable set of constraints constants. This is evidenced by the fact that more than twenty different constraints composites were created throughout the process.

A zoning layer was then added (digitized from best available source documents to accurately reflect current conditions) and mathematically intersected with the constraints composite. This permited automated calculations of developable area within individual zoning districts, as well as town-wide.

In Figures 2.3 and 2.4, bold lines represent zoning district boundaries.

As the spatial data components were being developed in ESRI ArcView 3.2 software, tabular zoning details were assembled in Microsoft Excel spreadsheet format. These included setback and minimum lot size requirements, floor-to-area ratios and numerous constraints multipliers that were extracted from official town by-laws and adjusted in some cases by local officials and planners to best reflect real world conditions.

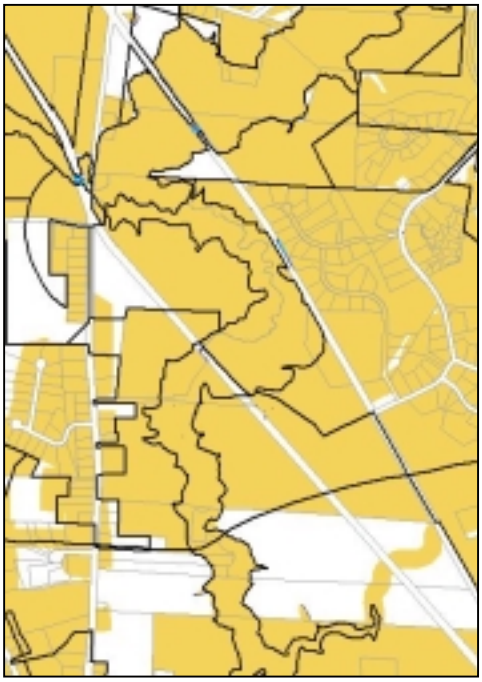


Figure 2.3: Constrained Land & Zoning: Shaded parcels represent **composite** of all land that is constrained and ineligible for future development.

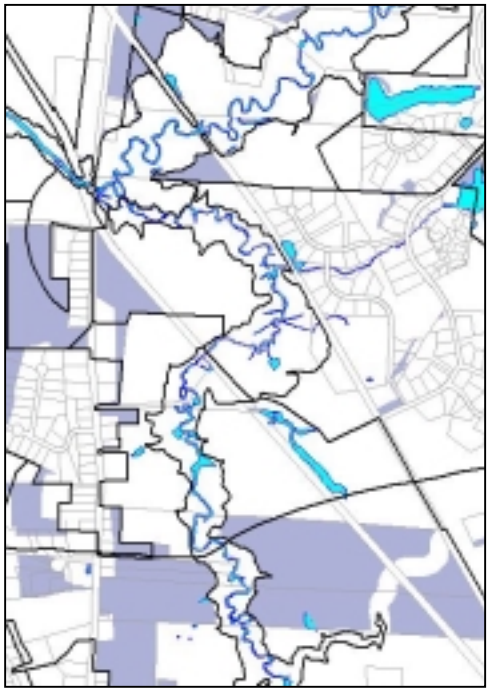


Figure 2.4: Developable Land & Zoning: Shaded parcels represent **composite** of all land that is not constrained and may be built upon.

These tables were linked to the zoning district area calculations created by the GIS. The result of this linkage was a Microsoft Excel based workbook including areal totals and extrapolated values for additional population, water consumption, municipal solid waste production and other loads. Examples of these outputs are available in the appendices to this document.

Because of the flexibility of the software and data, a range of reasonable results can be generated quite easily. For instance, if future development within districts zoned for mixed use is assumed as equally split between residential and commercial, results will be considerably different than if these two uses are skewed disproportionately in one direction or the other.

Likewise, if wetlands, considered as a partial constraint, are assumed to allow an average of only 25% buildability on land they impact, this will result in hundreds fewer dwelling units town-wide than if wetlands are assumed to be 75% developable.

A great deal of local input is essential during the tuning of the model to assure rational inputs for these numerous variables. This was achieved through multiple meetings in the Amherst Planning Department and with extensive phonework, email and Web-postings.

The following build-out totals (rounded) were presented at the May 11 workshop:

- 4000 acres of buildable land
- 3400 additional dwelling units
- 8800 additional residents
- 3.9 million square feet of additional commercial space

A complete build-out summary table may be found in Appendix F.

Future Development Alternatives

With the extent of constrained lands and input value assumptions established, the AGI/Herr team worked with Amherst to produce alternative development scenarios that would contrast different strategies of future growth.

Calculations indicated land resources and zoning requirements will permit more than 3400 additional dwelling units by the time the town attains full build-out. Where would these new structures be located? How are they to be distributed throughout the community? The colored areas of Figure 2.3 provide the initial answer: anywhere that is not constrained by physical conditions or regulation.

Significant to this analysis was extension of the typical polygon-based depiction of future build-out to a point-based version where additional dwelling units were modeled individually. This required specific placement of individual dwelling unit locations on project maps.

Once remaining developable land and legal buildable limits had been established, a random dot placement routine was used to add dwelling units within these polygons. Since such algorithms do little to take real world landscape into account, their placement follows illogical patterns when viewed by individuals familiar with local conditions. These conflicts were diminished by follow-up adjustment of dot placement to fit more appropriately with the underlying landscape. New development points were placed in single (small dot) and 5 (large dot) dwelling unit sizes.

The impact of shaded polygon versus specific point placement in indicating future development potential turned out to be significant. As the following illustrations show, it is much easier to visualize the consequences of a point placed in a familiar area than it is with a colorfully shaded shape.

During the workshops and afterward the physical placement of the points instigated significant and occasionally heated debate. "How can you expect to put 10 units of housing right next to my yard," or "This one is nearly in my pool," were typical comments. Of course the model does not pretend to know where specific locations of new dwellings would occur; it simply distributes them according to the dictates of available land and zoning regulations. But the looming potential of additional development is made trenchantly apparent through such a depiction, and this serves to encourage further discussion and involvement in the ongoing process. This is a highly desirable outcome.

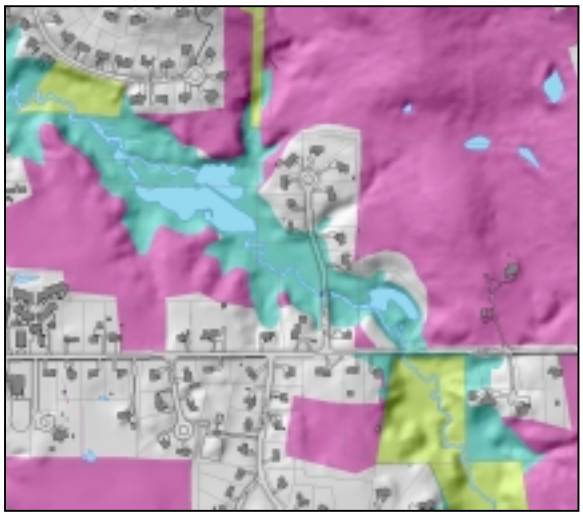


Figure 2.5: Developable as Polygons: Developable areas are shown above as purple-shaded areas. Lands subject to conservation restrictions are shown in green shades. Purple areas give no sense of allowable density of potential development within them.

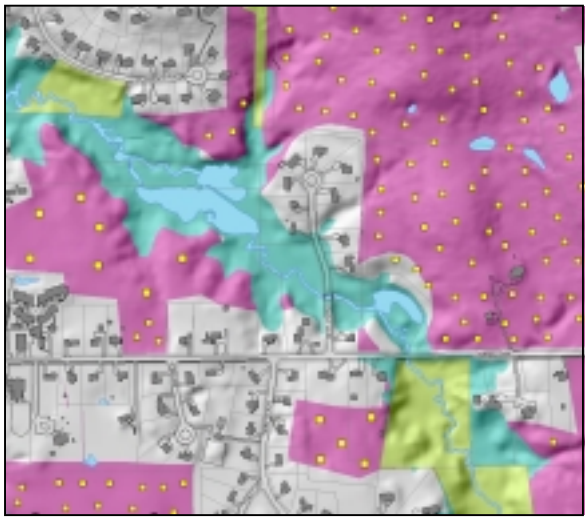


Figure 2.6: Developable as Points: Developable areas are shown above as both polygons and points. Quantity of points within developable areas conveys a truer sense of potential for development upon these parcels.

Following the workshops some specific location changes were made to remove points from a few obviously inappropriate locations, but large scale micro-location of these points is more appropriate to a follow-up study to this build-out, where local visioning and neighborhood design charettes are the focus of activity.

Research into earlier attempts by Amherst to plan for growth, such as Select Committee on Goals of the early 1970's, along with Comprehensive Plan Committee members' input informed the process for crafting future development scenarios. The town center and three village areas were established as candidates within which to locate future densification of development. These are plainly apparent in the maps on the following pages.

It was determined that four scenarios would be an appropriate number to compare and contrast in a workshop environment. AGI/Herr prepared the analysis and cartographic materials to present these in anticipation of the community workshop.

The **Base amount of growth, with pattern following current trends** scenario, or the "Do Nothing" scenario, attempts to model the results of a growth and development pattern following the same trajectory the Town is currently on.

Lowered growth following current trends uses primarily additional open space acquisitions to limit the number of new dwelling units.

Lowered growth directed toward the center of town attempts a combination of open space acquisition and development densification in and around the existing town center, utilizing infilling small lots and building vertically to reach build-out limits.

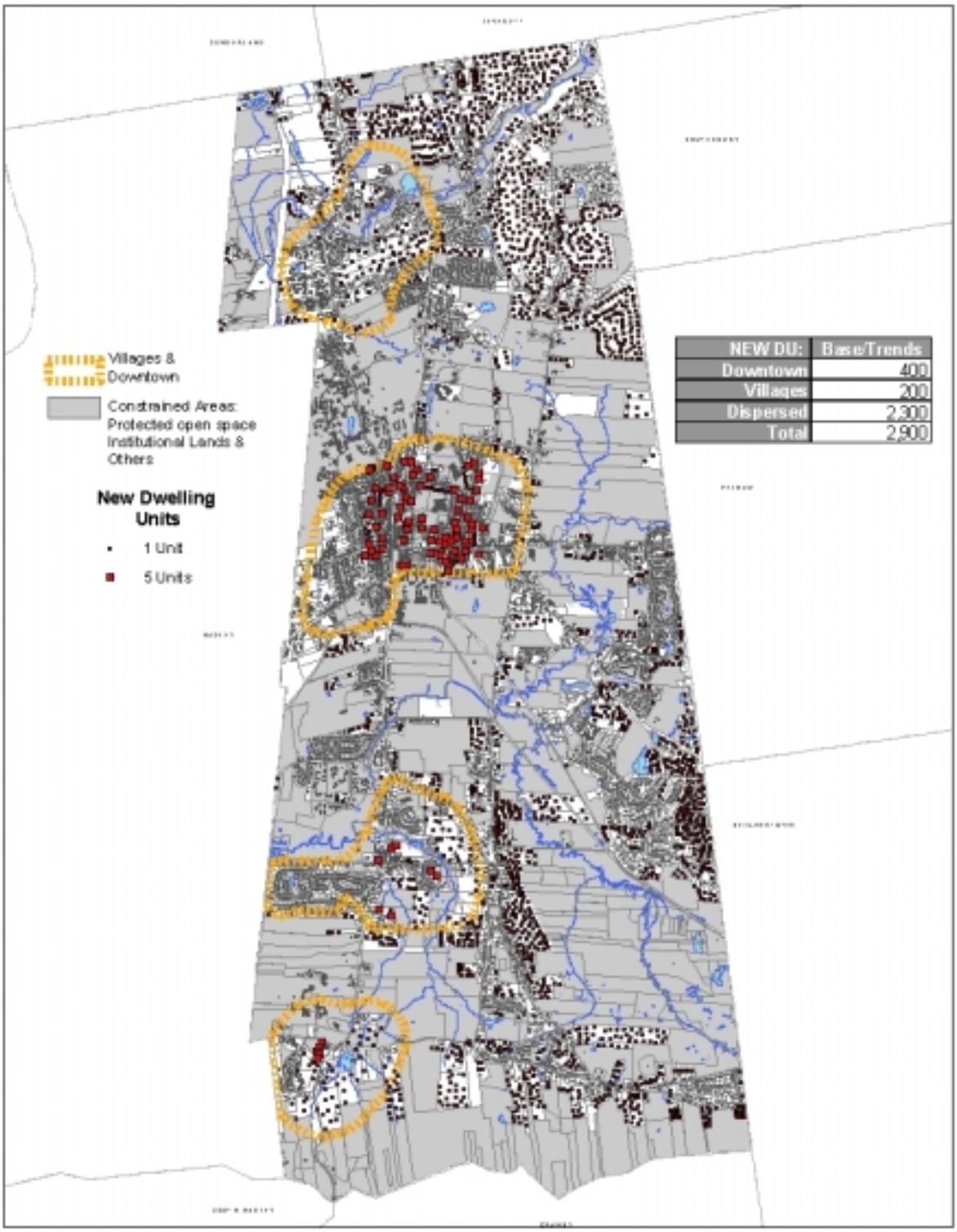
Lowered growth directed to the three villages utilizes a similar strategy but distributes the nodes of development among the three cluster areas as well as the town center (which in this case would be less densely infilled than the previous alternative.

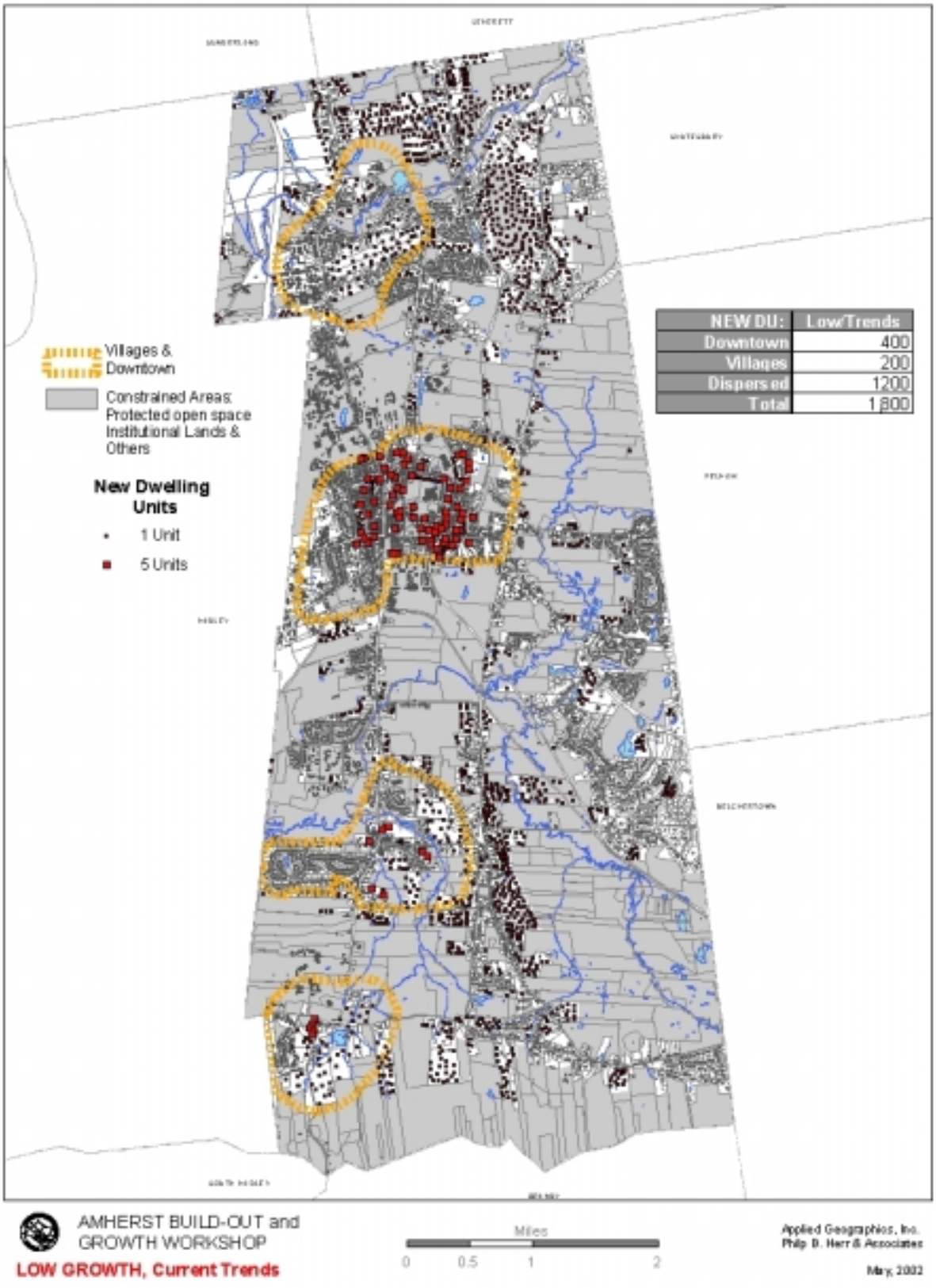
An in-depth analysis and 'report card' rating the relative merits of each of these alternatives may be found in Appendix C.

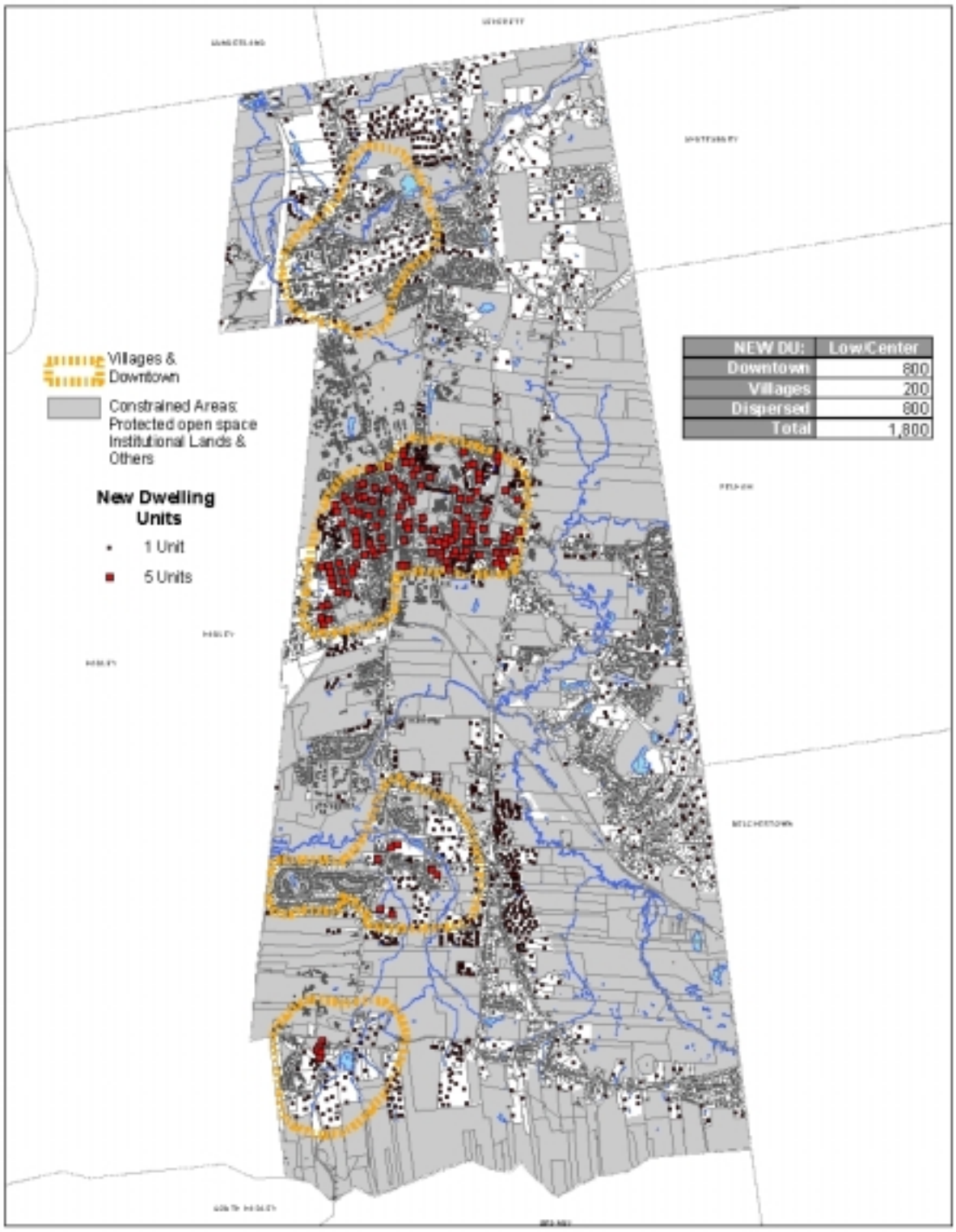
Simplified versions of these alternatives are presented on the following pages. Larger format versions (scaled down versions of those presented at the workshsop) may be viewed over the worldwide web at:

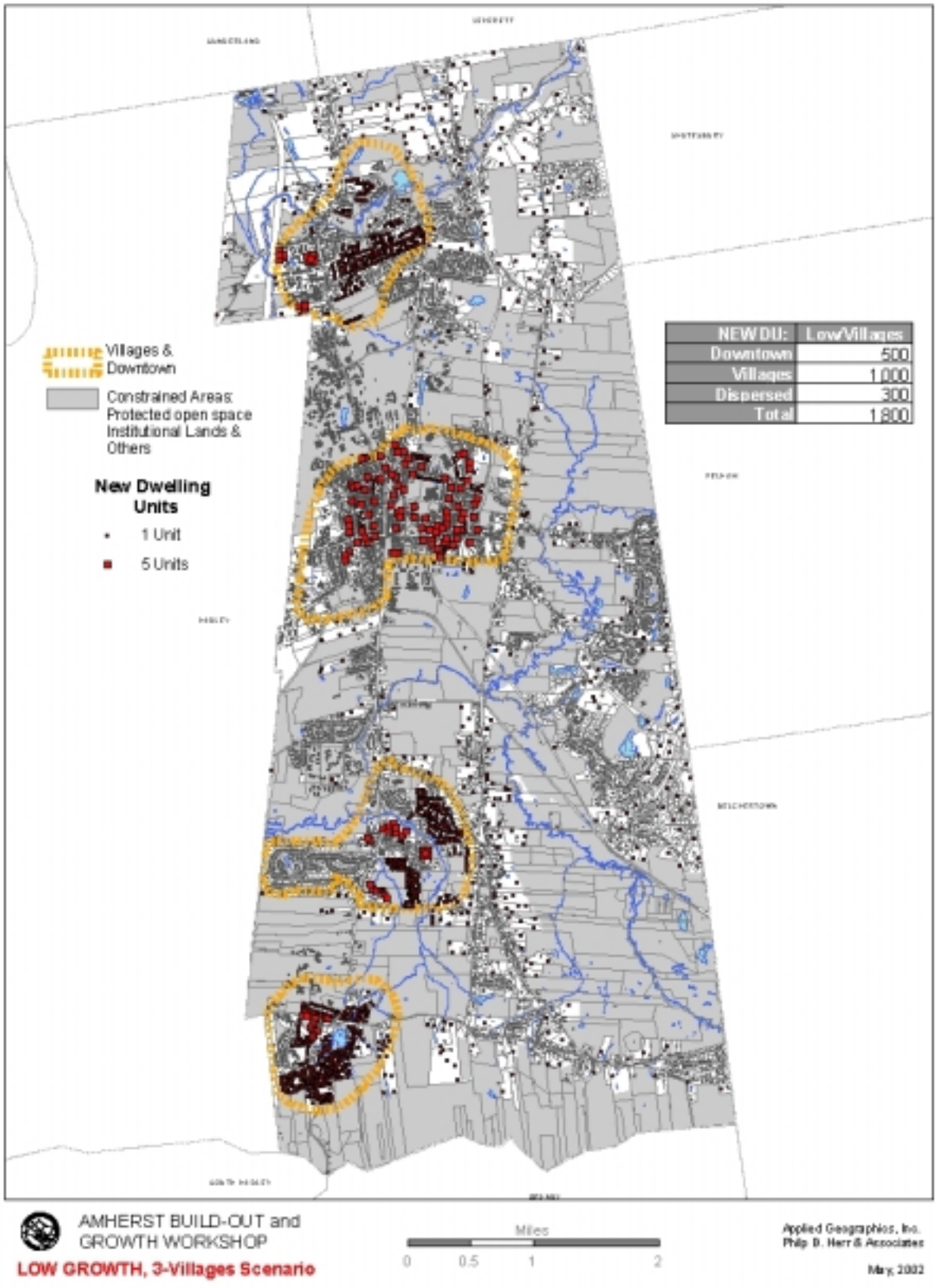
http://www.appgeo.com/clients/amherst/

Further details regarding this site are to be found in Appendix G of this document.


Villages & Downtown
Constrained Areas: Protected open space Institutional Lands & Others
New Dwelling Units
1 Unit
5 Units
NEW DU: | Base/Trends
Downtown | 400
Villages | 200
Dispersed | 2,300
Total | 2,900
AMHERST BUILD-OUT and GROWTH WORKSHOP
BASE SCENARIO, Current Trends
Miles
0 0.5 1 2
Applied Geographics, Inc.
Philip B. Herr & Associates
May, 2002


Villages & Downtown
Constrained Areas: Protected open space Institutional Lands & Others
New Dwelling Units
1 Unit
5 Units
NEW DU: | Low/Trends
Downtown | 400
Villages | 200
Dispersed | 1200
Total | 1,800
AMHERST BUILD-OUT and GROWTH WORKSHOP
LOW GROWTH, Current Trends
Miles
0 0.5 1 2
Applied Geographics, Inc.
Philip D. Herr & Associates
May 2002


Villages & Downtown
Constrained Areas: Protected open space Institutional Lands & Others
New Dwelling Units
1 Unit
5 Units
NEW DU: | Low/Center
Downtown | 800
Villages | 200
Dispersed | 800
Total | 1,800
AMHERST BUILD-OUT and GROWTH WORKSHOP
LOW GROWTH, Town Center Scenario
Miles
0 0.5 1 2
Applied Geographics, Inc.
Philip B. Herr & Associates
May, 2002


Villages & Downtown
Constrained Areas: Protected open space Institutional Lands & Others
New Dwelling Units
1 Unit
5 Units
NEW DU: | Low/Villages
Downtown | 500
Villages | 1,000
Dispersed | 300
Total | 1,800
AMHERST BUILD-OUT and GROWTH WORKSHOP
LOW GROWTH, 3-Villages Scenario
Miles
0 0.5 1 2
Applied Geographics, Inc.
Philip D. Herr & Associates
May, 2002

3.0 BUILD-OUT LESSONS and COMPREHENSIVE PLANNING

The Build-out Study was one of an ongoing series of planning efforts designed to guide the future of the Town from a long-term comprehensive perspective. In recent years this has been occurring under the aegis of the Amherst Comprehensive Planning Committee. This study has made a number of important contributions to that continuing planning effort, these among them.

- ❖ The study greatly clarified the scale of growth that can reasonably be expected in Amherst if current planning policies and regulations are continued into the future. It revealed the potential for more residential growth than had been calculated in earlier studies, and reaffirmed the earlier observation that the regulatory "envelope" for business development is so large that it dwarfs the anticipated market, even at build-out.

- ❖ The study made vivid that growth pattern alternatives, long discussed, can still be achieved, but that doing so is rapidly becoming more difficult as uncommitted land capacity becomes depleted. Sprawl is not inevitable, but avoiding it would require major policy, regulatory, and investment change in the near future.

- ❖ The dynamic dialog throughout the study corroborated the near-consensus among those vocally active in the Town's planning that efforts to focus growth and protect open landscapes deserve strengthening, and that the projected "trends continued" level of growth is undesirably high, even if guided towards a better pattern.

From those basic findings and from observations about how they relate to prior planning efforts, some more basic observations can be made about the potential value of a comprehensive planning effort at this point in Amherst's development. They also suggest some further observations about some principles that any such planning should follow.

Amherst has an enviable planning legacy. For many years the Town has enjoyed great respect across the Commonwealth for the quality of its planning efforts and for the results that it has achieved on the ground. Few Massachusetts communities can rival Amherst's accomplishments across a broad range of planning areas. These are just a few among the many topics where that is true.

- Housing, with more than 10% of all housing units in Amherst now categorized as "affordable," coupled with a growth rate firmly under control.

- Protection of open space and agricultural lands, using a broad array of tools including both acquisition and regulatory innovations.

- Transportation, with a rural-serving public transportation system that is the envy of other regions.

- Land use, with a vibrant downtown, working countryside, a network of recognizable village nodes, and a variety of other distinctive areas offering a rich choice of life-style contexts.

- Broad community involvement, supporting a wide range of views in lively exchange that has historically reached enough agreement to have resulted in a remarkable record of public achievements, such as the above.

Planning and Action

Still, a common observation among participants at the Build-out Workshop was regret that the Town had not acted more strongly some years ago when available planning choices were wider than those still remaining. Those familiar with the Town's planning history pointed to the visions of the 1973 Select Committee on Goals (SCOG) which advocated five compact village centers, an enhanced Town Center, and an integrated system of open space lands. Actions to implement SCOG's recommendations were taken to Town Meeting, but did not prevail.

> *That kind of "disconnect" between planning and town meetings is common across Massachusetts. A well-structured comprehensive planning program could address that disconnect in two ways. First it could assure that the same diverse set of values and perspectives that make up town meeting are really engaged and have an effective voice in the planning and its outcomes. Second, it could assure that planning and local community legislative action are structured as an ongoing process of interaction, not as a pair of steps taken serially, step one to "propose," step two to "dispose."*

Comprehensiveness

In attempting to produce futures that depart significantly from the "trends extended" baseline, it became clear that although the potential for significant land use pattern choices still exists, implementation of such choices can't be produced by any single mechanism. Zoning action taken alone can't achieve a strong center or a real village pattern, nor can open space preservation, nor can infrastructure configuration, even if designed to direct rather than follow patterns of land use. Choice can be achieved only through the use of all of those tools in concert with one another. It won't happen if utility configurations are dictated solely by servicing existing and predicted demand. It won't happen if public investments in open space are wholly driven by a single public purpose, whether biodiversity preservation or agricultural protection or other worthwhile consideration. It **can** happen if all of those means are joined by an intention to give shape to both development and open lands.

> *The "comprehensive" in "comprehensive planning" is about exactly that: making plans not from a single topical perspective but from many, taken in conjunction, reconciling any differences in favor of making Amherst the place that is wanted. For such a plan to be sound and effective, it must express the intentions of all of those whose actions it is meant to guide, which is easy to say but hard to really achieve. Doing that requires active participation in the process and the decision-making by a wide range of agencies and organizations so involved that they view the resulting plan as being their own. That plan-making involvement goes beyond day-to-day coordination since it deals with the demanding task of projecting how*

Amherst SHOULD be, not just how it is likely to be. The effective horizontal integration of topical roles and interests is a hallmark of good comprehensive planning, and sets it apart from the topical planning which is done by public organizations, notably including planning boards, in carrying out their mandated roles.

Participatory Inclusiveness

Participants in the Build-Out Workshop expressed broad agreement about two things. One, they felt that the current "trends extended" would NOT produce the Amherst they want. Two, they felt that the contrary views of people not present at the workshop were likely to pose an obstacle so immense that it threatens adoption of the changes necessary to produce anything but "trends extended." Whether the view of a different-thinking public is or is not accurate, the self-diagnostic of the group as not being fully reflective of the diversity of interests in the Town was certainly on the mark. Clearly, the stakes are very different for:

- People whose immediate environs would be little affected by a growth pattern choice that offers Town-level benefits of convenience and preservation, in contrast with those people for whom change threatens more traffic on their street, loss of neighborhood undeveloped land, and intrusion by new neighbors;

- People having major investments in now-developable land, in contrast with those who own no real estate at all;

- Those who expect to be short-term residents, in contrast with those having multi-generational roots and future expectations within the community.

Engaging the full diversity of community interests is very demanding, requiring real skill and resources to achieve. Posters and notices don't do the job.

By its nature, a good comprehensive planning program truly can engage a far richer diversity than is otherwise possible for narrower or shorter-term planning and design efforts. The very breadth of topics involved broadens the range of people with interests vitally affected. With a scope of perhaps two years of professional effort, participation can be designed and carried out with the same sensitive skill as the design of the topical elements, something rarely possible in any other form of municipal planning. With that more inclusive participation in decision-making, the disconnect between the planners and the planned-for can be virtually eliminated, commonly resolving what had been perceived as obstruction of "others."

Long term perspective

The opportunity to achieve a substantial departure from the "trends continued" projection has been steadily diminished over the years since, for example, the 1973 SCOG study, and it continues to be diminished despite modest current growth rates. If a nodal village structure is to be achieved then

strong open space, zoning and infrastructure steps towards its implementation will need to be taken quite soon. Those steps, no matter how strong, will only impact land use patterns on the ground after a long passage of years. Intervening in growth patterns requires steps to be taken now to serve long-term intentions, with only modest short-term "pay-back." That is not the business-as-usual style of government, with annual budget constraints, annual elections, and unquenchable thirst for more information before making long-term commitments. "Business-as-usual" almost precludes powerful long-term motivated action.

> *The Massachusetts statute on "Master Plans" (Section 81-D of Chapter 41, MGL) calls for them to be "a basis for decision-making regarding the **long-term** physical development of the municipality" (emphasis added). Master or comprehensive planning provides a singular opportunity for bringing a long-term perspective to municipal decision-making. Without a truly comprehensive planning effort any explorations of major town choices such as those discussed at the build-out workshop have little chance of resulting in real differences in the future of the community. That recalls again the experience of those who contributed so much in Amherst's planning efforts of the early 1970s.*

Where Now?

Our projections indicate that under current policies and regulations, including continued open space preservation efforts, the Town will reach build-out of 90% of its now-remaining capacity in just thirty years. Much of that depletion of resources is likely to happen in the next ten years before increasing land shortage slows growth even further. There is a window of opportunity for the Town to give direction to that growth. Doing so, however, will be very demanding on the Town's ability:

- To engage the full diversity of the community in the necessary planning,
- To plan comprehensively,
- To give importance to a long-term perspective, and
- To make planning and action inseparable parts of an integrated process.

Doing all that isn't business as usual, even among planners, but Amherst's record suggests that perhaps it can be done here and now in a way that again sets a standard for other communities who may benefit from this town's example.

Appendix A: WORKSHOP FLIP CHART REPORTS

At the May 11th workshop those participating broke into three groups, each to discuss one of three alternatives for the future pattern of growth in Amherst. Participants had a mapped build-out with "red-dot" symbols for new development reflecting a substantial reduction in the amount of future growth below that expected under current policies and rules:

- Current locational trends continued;
- Growth directed to the Town Center;
- Growth directed to three village centers as well as the Town Center.

Participants were asked to say what they liked and disliked about the alternative being discussed, to suggest how it could be improved, and to identify steps that the Town should take in light of having considered that alternative. Each group was supported by a facilitator and a Geographic Information System expert equipped to project map images from a computer system to help inform the discussion, supplementing the large-scale map print-outs that each group was given, and with which almost the entire cafeteria was hung.

On the following pages are the recorded responses, largely verbatim as taken from the sheets each group prepared. As such these are not intended to be organized narratives of the respective alternatives or well digested collective thought, but a faithful transcript of the responses as they were delivered.

CURRENT TRENDS ALTERNATIVE

Good	Bad
	Color Blind- cannot see colored dots Many (11) units w/o frontage
This plan more realistic - Doesn't require zone changes	Degree of reality of dots must be questioned placement too random
More realistic, large lots People want to live this way	Assumes a lot, people will maximize lots, won't build lots; doesn't reflect will of Inst. to sell land, unrealistically high
Most realistic scenario takes OS further; schools recreation influences	Town more difficult to live in based on current development, lot costs to afford. homes
Good job presenting complex complex issues; unthreatening	Commercial Industrial piece: what about business what is our thinking? Would any of the land actually be developed this way?
Useful format for starting discussion about land	5 unit bldg. in my front yard, omits 5 units being built; Hawthorne Farm threatened, omits univ. housing devl. What is effect on town of Umass absorbing more students?
Clarifications, impressed w/ maps as a planning tool GIS advantage	Very complex questions; NE forest land is a sensitive issue;
Impressive representation of alternatives	What is realistic? Dot placement inaccurate Will people sell land according to this pattern?
Useful starting point.	Not completely accurate – dots are confusing

CURRENT TRENDS ALTERNATIVE (continued)

Good	Bad
Good process to have a pattern of plans. Need a tool for decisions of planning board. Gives town input, guides planning decisions; continue trends w/new houses and vistas (slow); w/o plans-in hands of private developers based on zoning Dots are only conceptual; Concentrations have meaning	Developers are the instigators zoning = what is legal
Excellent, simplified, clarified great technology, opportunity to stem the tide of this kind of development Concentrate development where it makes sense	Not the most realistic map of how people want to live. potential of red dots being reality is bad, reduce dots

CURRENT TRENDS ALTERNATIVE: Review Comments

- Concentrate development where it makes sense to do so
- Unique and high quality locations should be highlighted
- Most likely scenario, among 3, but the dots should be removed
- Developers are desperate for land
- Landowners will be willing to sell as land prices increase

CURRENT TRENDS ALTERNATIVE (continued)

Next Steps

1. Amherst needs an interactive vs. the current reactive process to respond to landowners/developers decisions

2. What are the provisions for affordable housing within this scheme? Does this force gentrification? Market forces will not promote affordable housing.

3. Review must be conducted of the areas zoned for research and commercial development – also light industrial districts.

4. More accurate detail is required to judge the reality of the development areas. Overall refinement of the model will improve the process.

5. The *Current Trends* alternative appears to be the most likely way town will continue to develop.

TOWN CENTER ALTERNATIVE

Good	Bad
• Will somewhat limit vehicular traffic to downtown focus • Fewer cars • Walkable • Potential for more vitality in town center • Promotes pedestrians • Potential for tying into greenway • "Walkable" growth • Potential for Kendrick Park • Sensitive infill will promote more of the same • Potential for focus of development around garage • Potential for infill around existing housing - Mother-in-law apartments, etc.	• Promote congestion • Lack of parking • Traffic and transportation • Concern re: downtown res. units w/o parking • Can open space be balanced with additional res./com. growth? • Conflict of "student" vs. "other" business • Physical layout of streets • Neighborhood concern re: additional housing for "students" • Very segregating – social issues • Not organic • Will require more political finesse

Issues

- Transportation – Trolley service between village centers
- Question validity of large pedestrian square
- Internal vs. external congestion
- How can the center be circumvented by traffic?
- Additional residential growth downtown requires appropriate business development
- Social policy issues are a concern: affordable housing is a perpetual issue
- Should there be a downtown parking fund (like Noho's)?
- There will be strong resistance of neighborhoods to infill
- How can we pull/keep people downtown vs. going to malls?
- What will happen if gas prices increase?
- How do we encourage pedestrian circulation and discourage vehicular traffic
- How are we to apportion "student" vs. "affordable" housing

TOWN CENTER ALTERNATIVE (continued)

Action Items

- Make maps more readable
- Review of zoning changes required to bring this alternative into being
- Perform a planning exercise of what downtown would look like if developed in accordance with this alternative
- Need to include commmercial issues of residential growth
- Need to expand process to include a greater cross section of the community
- Need to develop strategies for communicating “planning” issues to general public
- Need to target specific community groups “outreach” “focus groups”

THREE VILLAGES ALTERNATIVE

General Comments:

- 300 dwelling units is the baseline for a sustainable village node
- Existing sewer placement must be considered more specifically
- Atkins Corner, South Amherst, North Amherst are the villages illustrated in this alternative.

Pros	**Cons**
Greater density is created.	Stress on infrastructure
Maintains & encourages public transportation.	Views blocked
Significant value – collectively "as a place."	As conceived density not there yet too spread out
Less economic segregation.	Zoning support not in place to support adequate required density and quality of life
Mix of housing density, scale, income, use.	
Potential to densify around existing fabric w/o cutting into APR	Not enough, need to respect 10 minute rule – village neighborhoods
Good potential for mixed use	Political resistance, hard to overcome
Avoid becoming a bedroom community	

THREE VILLAGES ALTERNATIVE (continued)

Build-out Forum Summary:

- Redefine idea of town center -can be a variety of types of centers in town
- What zoning changes are required to create this densification?
- What is the appropriate transportation support to link and support these villages?
- Traffic must be controlled and noise disturbances minimized.
- Walkable areas and streets must be created along with densification. Sidewalks should be lined with trees.
- This alternative requires ongoing partnership with lenders, financial institutions
- Center types revolve around anchor. What will this be?
  - Common/cultural
  - Library
  - Commerce
  - Leisure
  - Education/preschool/daycare
- Conservation Commission must redefine its purview in village centers
- We must insure support for lower density in outlying areas

Appendix B: INITIAL GROWTH EXPLORATIONS

Delivered to the Town of Amherst Comprehensive Plan Committee: November 30, 2001;
Revised: February 25, 2002

We have modeled potential growth in Amherst reflecting a number of different estimates of the current build-out capacity of the Town. The purposes were:

- To get a sense of how much of the Town's future growth is yet to come, in order to gain perspective on the importance of the work we are undertaking.
- To illuminate the relationship between build-out capacity and the growth that the Town is likely to experience within some shorter periods of time, such as the next twenty years.
- To begin understanding the potential of open space protection to alter build-out levels.
- To identify how significant any differences in estimates of current build-out potential might be for policy choices about growth and development patterns.

The PVPC build-out analysis indicated the potential for Amherst to accommodate 1,500 dwelling units under current regulations in addition to the 9,400 units existing in 2000. Many apparently believe that estimate is too low, so we examined two additional build-out levels that might result from current zoning and other regulations: 2,500 units and 3,000 units. We projected dwelling unit development using a model that bases housing growth on the amount of remaining build-out capacity. That being its basis, the model shows growth declining over time as building opportunities are consumed by development, open space protection, and other non-residential uses. We calibrated the model as follows.

1. We estimated that open space preservation plus schools, recreation fields, and similar non-dwelling uses would consume residentially-zoned land at a rate equivalent to about 2% of the Town's remaining build-out capacity (measured in dwelling units) per year. Open space preservation alone since 1963 has averaged about 100 acres per year (see Table 1 and Charts 1 and 2). That currently would translate into about 20 dwelling units preempted per year after accounting for unbuildable wetlands and other constrained land, or about 1.3% of the 1,500 dwelling units of remaining capacity preempted per year. The percentage would be lower if the remaining capacity were in fact larger than 1,500 units.

2. We judged that for the current decade the rate of development, given no change in regulation or other land use interventions, will be similar to the rate of the past decade, since we know of no reason to judge otherwise (see Table 2 and Charts 3 and 4). Based on the premise of the model that land consumption slows growth, that is a generous estimate.

3. We calibrated the model to produce results for the next decade that closely parallel the outcomes of simple extrapolation of the past decade using either an average annual amount of housing production (61 dwelling units per year) or an average annual percentage increase in housing (0.7% per year). The primary calibration involved setting a five-year percentage rate of housing consumption of build-out capacity at a level that produced the intended outcome (see Table 3 and Charts 5 and 6).

That modeling isn't based on study of the regional economy or birth rates and death rates or any other demographic considerations, but rather it simply replicates recent history. We judged the past ten years to be a better indicator of future expectation than the past twenty years since we understand that the rates of growth experienced in the eighties are unlikely to be repeated. Zoning change is a major reason for that: zoning change joined development and land preservation in greatly reducing development opportunities in Amherst. The results of the modeling are shown on the following pages. Here are some observations about the results.

A. Projecting growth rate for the next decade to be similar to that of the past decade looks reasonable for the next decade, but not beyond that unless current capacity is actually 3,000 housing units or more. Site scarcity seems almost certain to be significantly slowing growth after this decade unless regulatory change (or departure) expands capacity. Growth more rapid than experienced in the past decade would be surprising, viewed from this perspective, even with an estimate of 2,500 units of remaining capacity.

B. The modeling was programmed to reflect the 250-unit two-year building rate regulation, but other considerations constrained projected growth to a lower level, even in the first five-year period modeled. Cutting the allowed building rate in half would reduce anticipated growth only in the first five-year interval, and only by a small amount (fewer than 100 units). Following that period housing growth as projected nearly "catches up" with the projection made assuming the current regulation.

C. After reflecting land potential used for things such as schools and open space, the added growth potential in these variations ranges from 1,200 housing units to 2,400 units, or a 13% to 25% increase above the year 2000 level. 1,200 housing units sprawling across the Town on large lots would have an impact on town character and functioning far greater than 13% to 21% growth superficially implies.

D. There might be an intention to guide much of future development into a number of substantial village nodes. If so, then the total of 1,200 to 2,400 additional housing units would be divided first between the rest of the Town and those nodes, and then among those nodes. That would mean that at build-out each of those nodes might have about 200 or so housing units each, which is more the scale of a "development" than a "village."

E. Schools, open space, and other non-residential uses are projected to occupy land capacity equivalent to about 400 to 800 housing units. The premise of the modeling as calibrated is that housing will consume about five times as much capacity as is used for those community uses.

However, some municipalities in recent years have actually protected land as rapidly as land is consumed for building.

Note that these are not “Growth Scenarios” which model the outcome of intentions for the future. They only model varying estimates of the housing potential provided under current rules. Later scenarios will reflect policy choice rather than technical uncertainties.

The modeling is done in an Excel Workbook titled “Data-2.xls” which we are happy to share with anyone interested.

Table 1. **OPEN SPACE PROTECTION** 2/24/02

OPEN SPACE TIME SERIES

Year	Acres protected		HU preempted	
	Annual	Cumulative	Annual	Cumulative
1963	33	33	6.2	6.2
1964	9	42	1.7	7.9
1965	11	53	2.2	10.0
1966	93	146	17.6	27.6
1967	0	146	0.0	27.6
1968	150	296	28.3	56.0
1969	119	415	22.5	78.5
1970	37	451	7.0	85.5
1971	64	515	12.1	97.6
1972	13	528	2.4	100.0
1973	42	570	7.9	107.9
1974	30	600	5.8	113.7
1975	41	641	7.8	121.5
1976	0	641	0.0	121.5
1977	39	681	7.5	128.9
1978	5	686	1.0	129.9
1979	25	711	4.8	134.7
1980	136	848	25.8	160.5
1981	24	871	4.5	165.0
1982	259	1,130	49.0	214.0
1983	255	1,385	48.3	262.3
1984	106	1,491	20.1	282.4
1985	157	1,648	29.7	312.1
1986	345	1,993	65.3	377.4
1987	168	2,161	31.7	409.2
1988	159	2,320	30.1	439.3
1989	340	2,660	64.4	503.7
1990	126	2,786	23.9	527.5
1991	40	2,826	7.6	535.1
1992	132	2,957	24.9	560.0
1993	115	3,072	21.8	581.8
1994	261	3,334	49.5	631.2
1995	217	3,551	41.1	672.3
1996	39	3,590	7.4	679.8
1997	92	3,682	17.4	697.1
1998	33	3,714	6.2	703.3
1999	83	3,797	15.7	719.0
2000	125	3,922	23.7	742.7
---	---	---	---	---
Total	3,922		743	
Annual	106		20	

Developable area (acres)	8,038
Potential housing units	1,522
Developable acres/potential unit	5.28

% of 2000 capacity preserved/year

Capacity estimate	Percent
1500	1.3%
2500	0.8%
3000	0.7%

Chart 1.

ANNUAL OPEN SPACE PROTECTION

Amherst 1963 - 2000

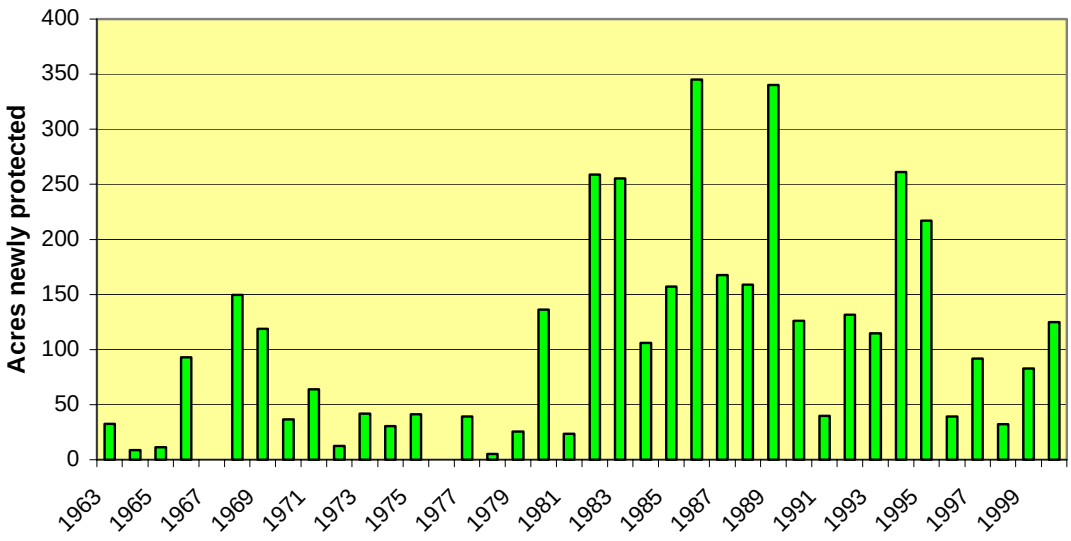


Chart 2.

CUMULATIVE OPEN SPACE PROTECTION

Amherst 1963 - 2000

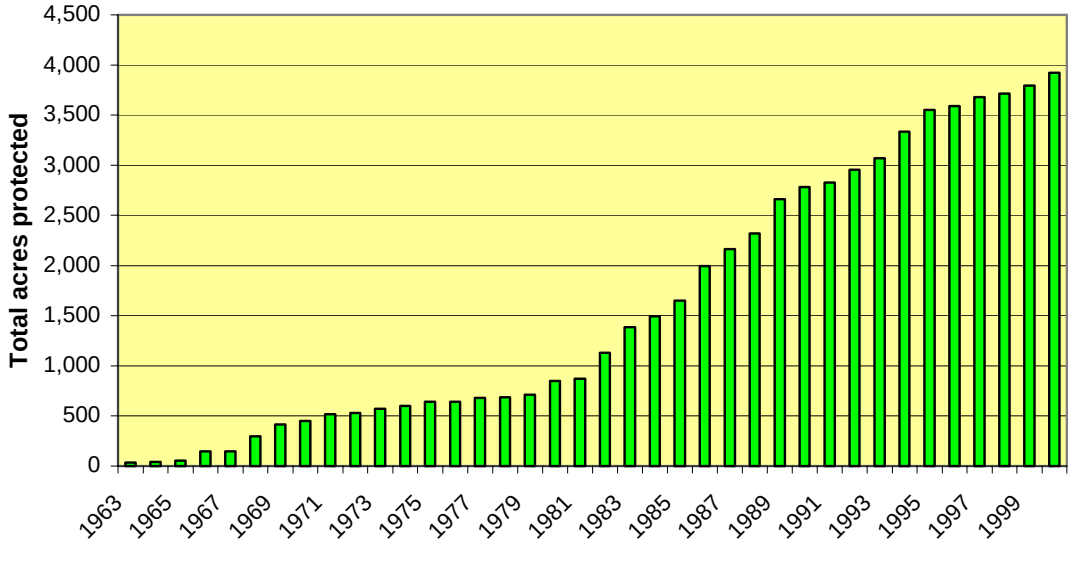


Table 2. **AMHERST BACKGROUND DATA** 2/24/02

Year	Amherst Jobs	Amherst Housing units				MA HU % Growth	Amherst Population
		Units Permitted					
		Annual	Cumulative	Total	% Growth		
1980	10,423	25	25	7,699	0.32%	0.71%	33,229
1981	10,818	48	73	7,725	0.62%	0.76%	
1982	11,829	16	89	7,775	0.21%	0.70%	
1983	11,788	63	152	7,792	0.81%	1.01%	
1984	9,768	88	240	7,857	1.12%	1.30%	
1985	10,283	170	410	7,949	2.14%	1.73%	
1986	10,373	206	616	8,126	2.54%	1.94%	
1987	10,739	151	767	8,340	1.81%	1.71%	
1988	11,072	74	841	8,497	0.87%	1.26%	
1989	10,983	233	1074	8,574	2.72%	0.87%	
1990	10,879	146	1220	8,816	1.66%	0.58%	35,228
1991	10,552	23	1243	8,980	0.26%	0.51%	
1992	10,324	36	1279	9,006	0.40%	0.66%	
1993	10,246	111	1390	9,047	1.23%	0.76%	
1994	10,528	48	1438	9,172	0.52%	0.71%	
1995	10,889	37	1475	9,226	0.40%	0.64%	
1996	11,146	49	1524	9,267	0.53%	0.67%	
1997	11,653	30	1554	9,322	0.32%	0.66%	
1998	12,023	37	1591	9,356	0.40%	0.74%	
1999	12,119	26	1617	9,398	0.28%	0.72%	
2000	12,408	44	1661	9,427	0.47%	0.69%	34,874
Change 1980 - 1990							
#	456			1,117			1,999
%	4.2%			12.7%		11.2%	5.7%
Change 1990 - 2000							
#	1,529			611			-354
%	14.1%			6.9%		6.9%	-1.0%

Sources Jobs: MA DET
Housing unit decennial totals: US Census.
Annual housing units permitted: modified from US Census to fit decennial totals.
Population: US Census.

AMHERST\Data!Data-2

Chart 3.

HOUSING UNITS AUTHORIZED

Amherst 1980 - 2000

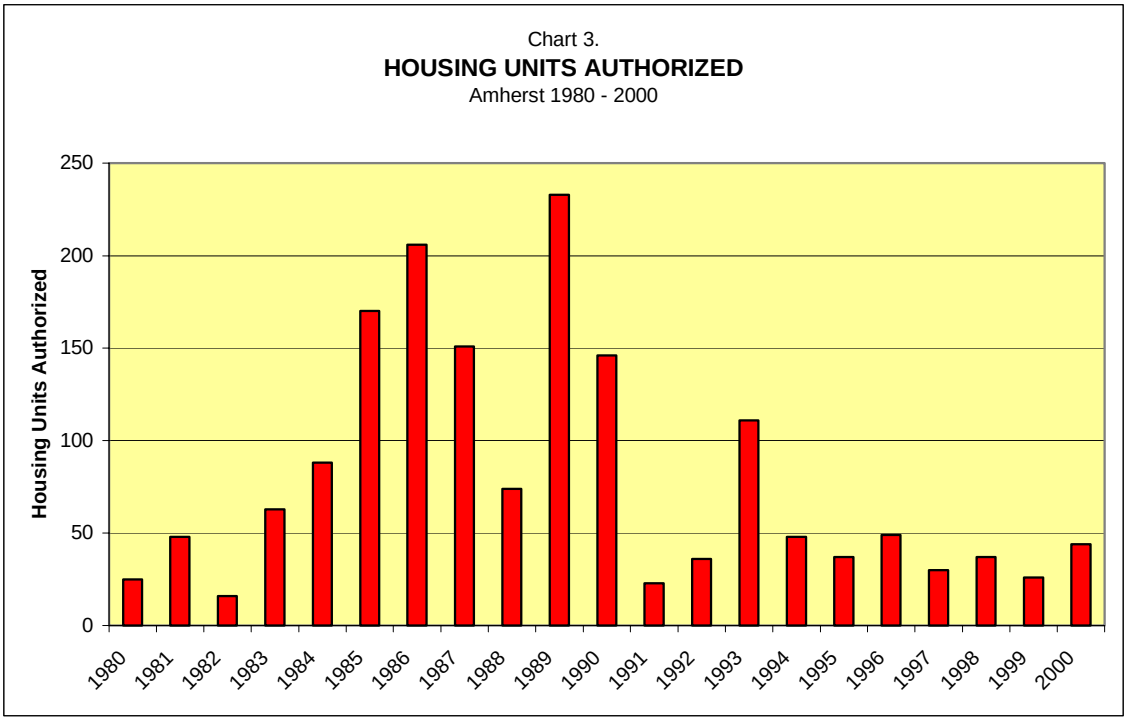


Chart 4.

CUMULATIVE HOUSING UNITS AUTHORIZED

Amherst 1980 - 2000

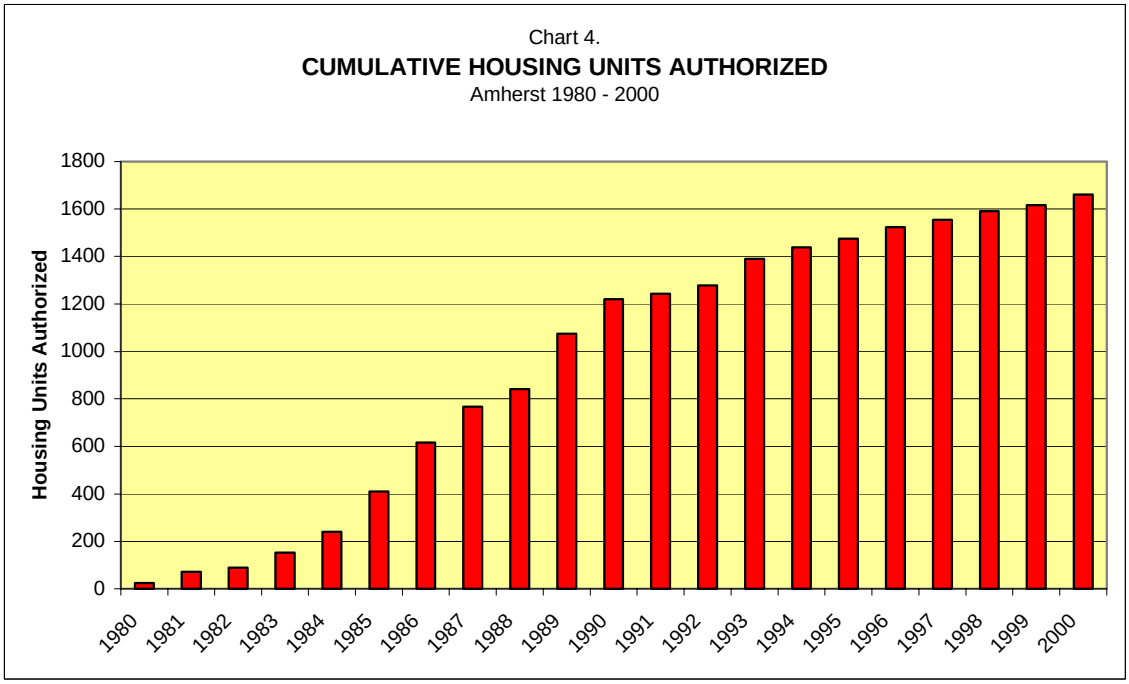


Table 3. **SCOPING PROJECTIONS: SMALL GROWTH POTENTIAL** 2/24/02

HISTORICAL BACKGROUND

Year	Jobs	Hsing Units	Population
1980	10,423	7,699	33,229
1990	10,879	8,816	35,228
2000	12,408	9,427	34,874

YEAR 2000 HOUSING DEVELOPMENT POTENTIAL: 1,500 HOUSING UNITS.

10-year historical annual housing growth

#	61.1
%	0.7%

Assumed 5-year housing potential depletion for:

Open space, schools, recreation	10.0%
Housing (for LAND model only)	26.0%
Regulatory housing unit limit/year	125

HOUSING UNIT PROJECTIONS 1500 UNITS BUILDOUT CAPACITY REMAINING

		# Projection		% Projection		LAND modeling		
Year	History	Existing	Unbuilt	Existing	Unbuilt	Existing	Unbuilt	% Increase
1980	7,699							
1985	8,258							
1990	8,816							
1995	9,122							
2000	9,427	9,427	1,500	9,427	1,500	9,427	1,500	0.0%
2005		9,733	1,045	9,748	1,029	9,817	960	4.1%
2010		10,038	643	10,080	601	10,067	614	6.8%
2015		10,344	276	10,424	196	10,226	393	8.5%
2020		10,649	(None)	10,779	(None)	10,329	252	9.6%
2025		10,955	(None)	11,146	(None)	10,394	161	10.3%
2030		11,260	(None)	11,526	(None)	10,436	103	10.7%
2035		11,566	(None)	11,919	(None)	10,463	66	11.0%
2040		11,871	(None)	12,325	(None)	10,480	42	11.2%
2045		12,177	(None)	12,745	(None)	10,491	27	11.3%
2050		12,482	(None)	13,179	(None)	10,498	17	11.4%
2055		12,788	(None)	13,628	(None)	10,502	11	11.4%
2060		13,093	(None)	14,092	(None)	10,505	7	11.4%

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Chart 5.

HOUSING PROJECTIONS: 1,500 unit capacity

Amherst to 1980 to 2060

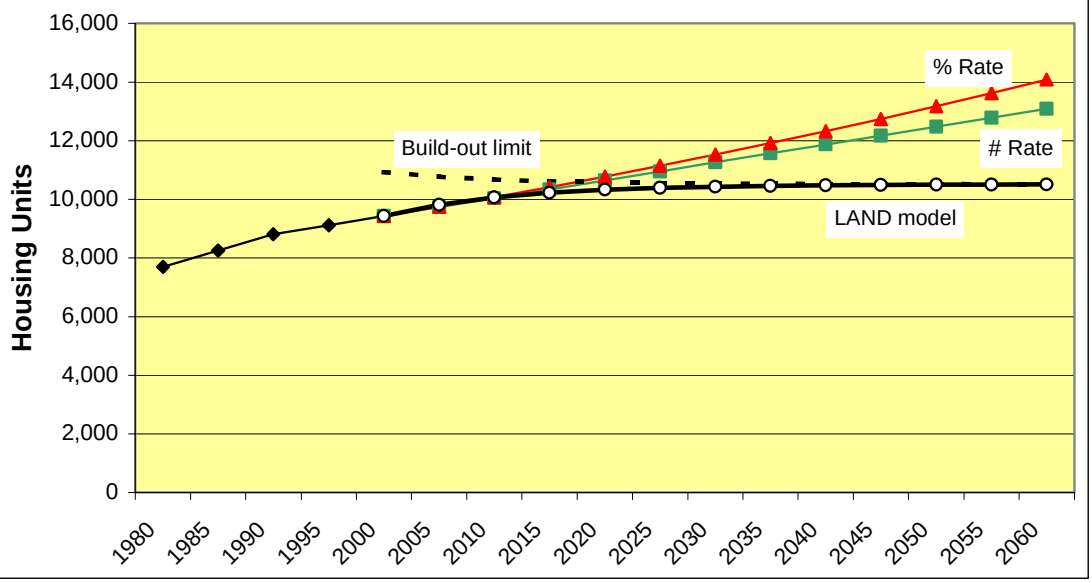


Chart 6.

HOUSING PROJECTIONS: 1,500 unit capacity

Amherst 1990 to 2020

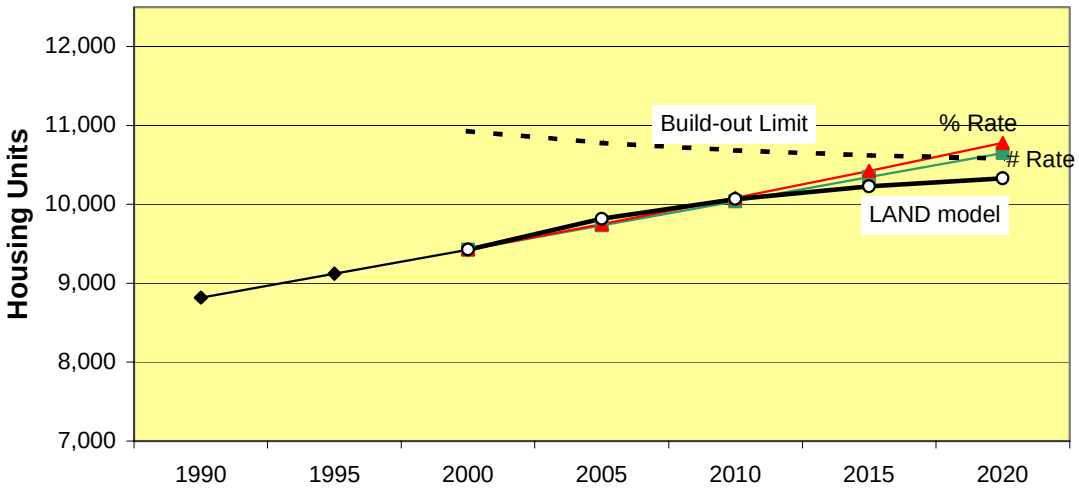
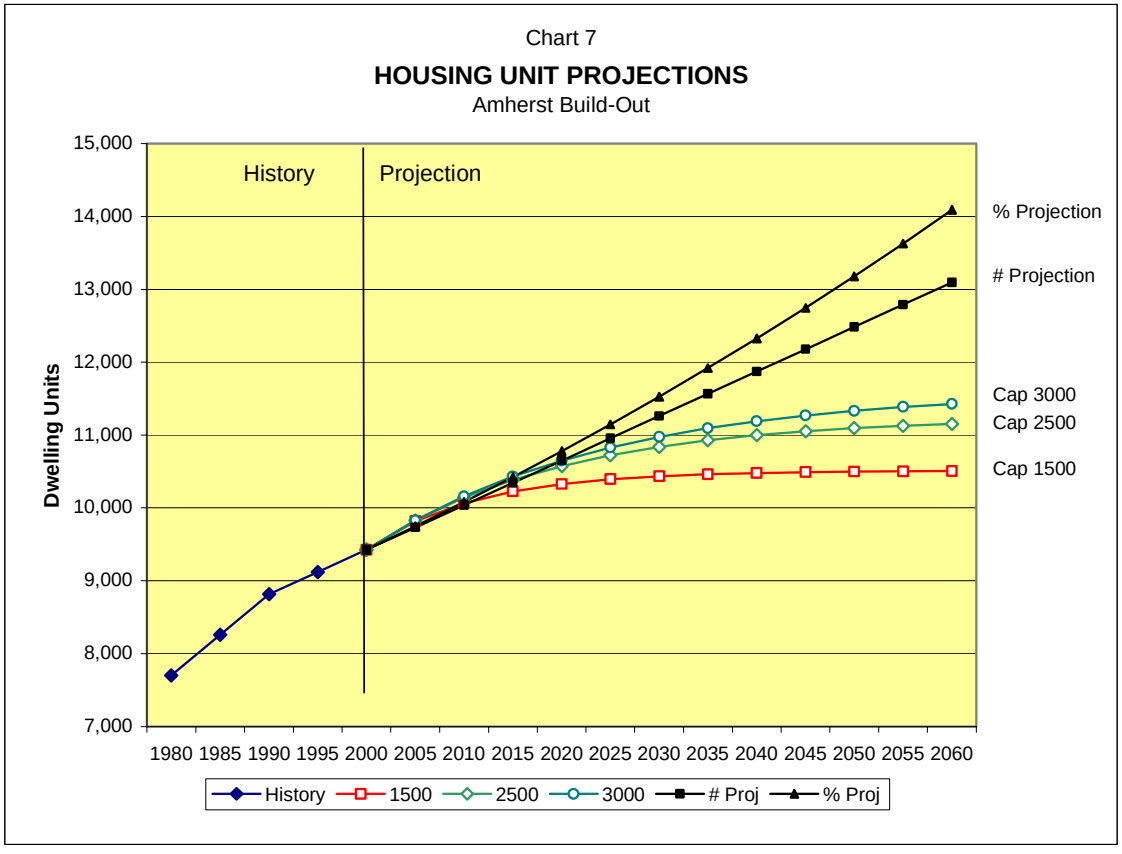


Table 4. **HOUSING UNITS PROJECTION SUMMARY** 2/24/02

Year	History	Extrapolations		Alternative capacity estimates			Preempted Unit Estimates		
		#	%	Cap 1,500	Cap 2,500	Cap 3,000	Cap 1,500	Cap 2,500	Cap 3,000
1980	7,699								
1985	8,258								
1990	8,816								
1995	9,122								
2000	9,427	9,427	9,427	9,427	9,427	9,427	0	0	0
2005		9,733	9,748	9,817	9,827	9,832	150	150	150
2010		10,038	10,080	10,067	10,139	10,162	246	267	272
2015		10,344	10,424	10,226	10,382	10,431	307	358	372
2020		10,649	10,779	10,329	10,572	10,650	347	429	453
2025		10,955	11,146	10,394	10,720	10,829	372	485	519
2030		11,260	11,526	10,436	10,836	10,975	388	528	573
2035		11,566	11,919	10,463	10,926	11,093	398	562	617
2040		11,871	12,325	10,480	10,996	11,190	405	588	653
2045		12,177	12,745	10,491	11,051	11,269	409	609	682
2050		12,482	13,179	10,498	11,094	11,333	412	625	706
2055		12,788	13,628	10,502	11,127	11,386	414	637	725
2060		13,093	14,092	10,505	11,153	11,428	415	647	741

Chart 7



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Appendix C: AMHERST BUILD-OUT and GROWTH STUDY

Prepared by AGI and Philp B. Herr & Associates with the Amherst Planning Department
Delivered to the Town of Amherst Planningn Board and Comprehensive Plan Committee
May 11, 2002

In order to plan for current decisions on such things as zoning, utilities, and open space it is important to have a clear understanding of what potential for future growth the Town contains, and what alternatives can be realistically considered for shaping the size and pattern of that growth. This study effort has been undertaken, funded by a Town appropriation, in order to get answers to those questions. In this program:

- Previous studies have been reviewed and drawn upon, especially land inventory data prepared by the Town and build-out projections of the Pioneer Valley Planning Commission.

- An estimate has been made of the total build-out potential of the Town, measured in dwellings and business floor area, given current zoning and land ownership patterns. Selected impacts of such development have been estimated.

- Alternatives to that "status quo" future have been shaped, and three of them were selected for further analysis and consideration, including public review at the May 11, 2002 workshop.

In brief, the Town had about 9,400 dwelling units in 2000, our base year for study. Current zoning would allow addition of about 3,600 dwelling units to that total, an addition of about 38%. That potential includes some amount of redevelopment of existing houses to accommodate additional units as zoning allows, but does not include building where prohibited by environmental rules, and includes only limited development on lands owned by the Town's educational institutions. It reflects a continuation of open space protection at about the rate experienced over recent decades.

Build-out to the full estimated land capacity might mean a Town population of 43,000 or so residents, compared with 35,000 today, with comparable increases in all the impacts of development, including both economic support and demands on services and resources. Some impacts, such those on community character, would depend upon just how those additional 3,600 dwelling units are located, whether continuing recent trends, focusing on a strong center, or forming new village centers at some number of locations. In exploring those pattern choices it became clear that their feasible differences were rather small if 3,600 units were to be accommodated, but would be more substantial if that added number were reduced to, say, only half that increase, or 1,800 added housing units. That might be accomplished through some combination of zoning or other regulations and deeded protections such as through expanded acquisition for open space.

On that basis, four alternatives for "build-out" have been created for exploring impacts and making comparisons:

- ❖ Base amount of growth, with pattern following current trends.
- ❖ Lowered amount of growth, following current pattern trends.
- ❖ Lowered growth, strongly directed to the Center of town.
- ❖ Lowered growth, strongly directed to three new villages.

An illustrative map has been prepared for each alternative. None are proposals, and none pretend to be careful designs for site planning, but rather are simply broadly plausible pattern alternatives intended to provide a basis for beginning conversation about such questions as:

- ❖ What things appear to be the really good points and really bad points about each of these pattern alternatives?
- ❖ Are there action steps that these alternatives suggest that the Town should pursue, whether further study and planning, or strong implementing actions to assure that one or another of these growth and pattern choices actually is achieved?
- ❖ What should the Town do NEXT?

A certain amount of impact information on the alternatives has been developed and is provided on following pages. All of it is at a sketch level of detail, subject to further study and refinement as these questions continue to be explored.

BREAKOUT TASKS

Here are the steps to be followed by separate groups in the Workshop breakout session.

1. Review your group's Alternative map and "Report Card" in order to become familiar with them and what they indicate.
2. Taking turns, each person participating should introduce him/herself, then suggest one thing about your group's Alternative that he or she feels is really good about it and one thing about it that he or she thinks is really bad. Follow "brainstorming" rules: there are no "wrong" answers, so keep the statements short, and no debate or even snickers about other people's thoughts. If on your turn you think of nothing new then just underscore something already said by others.
3. When all in the group have made their comments, see if you can collectively devise and agree on ways to revise the Alternative so as to mitigate things that some view as bad or to strengthen aspects generally seen as good, while staying consistent with the alternative's defining level of growth and pattern type.

4. As a group, list a number of concrete ideas for the Town's planning suggested by review of the Alternative, and select three of those ideas as your highest priority.

5. Summarize a presentation of what your group wants to report to the others when we all reconvene.

6. With any time that may remain, collect any further observations individuals may have about the Alternative map and the Report Card, and record them on paper or in the computer.

GROWTH ALTERNATIVES AND ACTION CORROLLARIES

A L T E R N A T I V E S

Town-wide growth	Base growth	Lowered growth		
Pattern	Trend continued		Strong Center	3-Village
ZONING DENSITY				
Downtown	Current	Current	Much Higher	Higher
Villages	Current	Lower	Current	Higher
Outlying	Current	Lower	Lower	Lower
TRANSFER OF DEVELOPMENT RIGHTS				
Downtown	-	-	Receiving	Receiving
Villages	-	-	-	Receiving
Outlying	-	-	Sending	Sending
OPEN SPACE PRIORITY				
Downtown	Current	Current	Lower	Lower
Villages	Current	Current	Current	Lower
Outlying	Current	Higher	Higher	Higher

ALTERNATIVES "REPORT CARD"

GROWTH AND PATTERN ALTERNATIVES 07-May-02

Town-wide growth	**Base**	**Low Growth**		
Pattern	**Trends**	**Trends**	**Center**	**3-Village**
HOUSING DEVELOPMENT				
Year 2000 dwelling units				
Downtown	2,300	2,300	2,300	2,300
Potential village sites	2,200	2,200	2,200	2,200
Dispersed	4,900	4,900	4,900	4,900
Total	9,400	9,400	9,400	9,400
Dwelling units built from 2000 to buildout				
Downtown	400	400	800	500
Potential village sites	200	200	200	1,000
Dispersed	2,400	1,200	800	300
Total	3,000	1,800	1,800	1,800
Total dwelling units at build-out				
Downtown	2,700	2,700	3,100	2,800
Potential village sites	2,400	2,400	2,400	3,200
Dispersed	7,300	6,100	5,700	5,200
Total	12,400	11,200	11,200	11,200
OPEN SPACE (acres)				
Year 2000 open space				
Downtown	10	10	10	10
Potential village sites	190	190	190	190
Dispersed	600	600	600	600
Total	800	800	800	800
Open space protected from 2000 to buildout				
Downtown	10	10	0	0
Potential village sites	50	50	50	30
Dispersed	320	1,120	1,140	1,180
Total	380	1,180	1,190	1,210
Total open space at build-out				
Downtown	20	20	10	10
Potential village sites	240	240	240	220
Dispersed	920	1,720	1,740	1,780
Total	1,180	1,980	1,990	2,010

Amherst\Alternatives-2!Impacts

ALTERNATIVES "REPORT CARD"

IMPACTS OF GROWTH LEVEL AT BUILD-OUT

Housing units					
	Buildout total	12,400	11,200	11,200	11,200
	20-year rate of growth				
	Year of 90% build-out				
Population					
	Household				
	Institutional				
	Total				
Infrastructure					
	School enrollment				
	Water consumption				
	Solid waste				

IMPACTS OF GROWTH LEVEL AND PATTERN AT BUILD-OUT

Land use (acres)					
	Developed				
	Total acres				
	Acres/dwelling unit				
	Open space				
	Total acres	1,180	1,980	1,990	2,010
	Acres/dwelling unit	0.10	0.18	0.18	0.18
Pattern					
	% dus in villages				
	% dus <1/2 mile to school				
	Impervious sf/du				
Infrastructure					
	New road miles				
	Wastewater management				
	# dus sewered				
	% dus sewered				
	Unsewered units/acre				
Regulatory effort					
	% land w/big rule change	None	Large	Largest	Large
	Level of innovation reqd.	Status quo	Much	Most	Much
	Administrative burden	Status quo	Much	Most	Much

Amherst\Alternatives-2!Impacts

Appendix D: AMHERST ZONING DISTRICTS AND BUILD-OUT ASSUMPTIONS

The following table describes zoning characteristics of the Town of Amherst.

Zone Name	Zone District	Permitted Use Type	Permitted Use	Permitted Use Percent of Zone	Minimum Lot Size	Minimum Lot Area Per Unit (R)	Floor-to-Area Ratio (C)	Road / Odd Lot Factor	Minimum Frontage
Commercial (COM)	COM	C	Retail/Com along Primary Roads	100%	80000	80000	0.35	1.00	100
Educational (ED)	ED	R	Educational Residential	100%	1742407	1742407	0	0.80	100
Flood Prone Conservancy (FPC-80)	FPC	R	Restricted: Hydrology Protection	100%	999999999	999999999	0	0.80	200
Fraternity Residence (RF)	RF	R	Residential: Fraternities, Sororities	100%	40000	40000	0	0.80	150
General Business (BG)	BG	R	Mixed Use (High Density Res)	67%	12000	4417	0	0.80	100
General Business (BG)	BG	C	Mixed Use (Various Commercial)	33%	12000	12000	0.35	1.00	100
General Residence (RG-12)	RG	R	Residential: Medium - High Density	100%	12000	8833	0	0.80	100
Light Industrial (LI)	LI	C	Manufacture, Warehouse, Wholesale	100%	30000	30000	0.35	1.00	100
Limited Business (BL)	BL	R	Mixed Use (Moderate Density Res)	67%	20000	7333	0	0.80	125
Limited Business (BL)	BL	C	Mixed Use (Various Commercial)	33%	20000	20000	0.35	1.00	125
Low Density Residence (RLD-80)	RLD	R	Residential: Lowest Density	100%	80000	80000	0	0.80	200
Neighborhood Residential (RN-20)	RN	R	Residential: Medium Density	100%	20000	17333	0	0.80	120
Office Parks (OP)	OP	C	Office and Limited Research	100%	40000	40000	0.35	0.80	100
Outlying Residential (RO-30)	RO	R	Residential Medium - Low Density	100%	30000	26923	0	0.80	150
Professional Research (PRP)	PRP	C	Industrial Office Parks	100%	30000	30000	0.35	1.00	100
Village Center Business (BVC)	BVC	R	Mixed Use (Medium Density Res)	67%	15000	14167	0	0.80	100
Village Center Business (BVC)	BVC	C	Mixed Use (Various Commercial)	33%	15000	15000	0.35	1.00	100
Village Center Residence (RVC)	RVC	R	Mixed Use: Village Residential	67%	15000	11333	0	0.80	120
Village Center Residence (RVC)	RVC	C	Mixed Use: Village Office	33%	15000	15000	0.35	1.00	120

NOTES: **1.** Unshaded cell values are transcribed directly from municipal by-laws; Green shaded values are derived with the assistance of municipal officials or inserted as hypothetical holding variables for purposes of completing the buildout analysis. **2.** Flood Prone Conservancy Lot Sizes hyperbolically inflated to eliminate developable lots while retaining district area for summary calculations.

Definitions:

Zone District:
Key field that relates to the ZONING field in the DevCon.dbf file from scenario generation. Contains codes for all zoning districts in the analysis area (municipality or region). These codes must match DevCon.dbf ZONING codes exactly.

Permitted Use Type:
In the output tables, build-out analysis is broken into independent sheets for commercial and residential land. Individual use types must be coded appropriately. The valid entries are:

R: Residential
C: Commercial
U: Unknown: Should only be used for anomalies (land that is outside of boundaries, etc). All land within analysis area should be coded as R or C.

Permitted Use:
Description of the use permitted under this district. Notice that in the above example there are numerous R-2 districts. The Input-Zoning table permits mixed use modeling, so a single Zone District can be broken into any

number of Permitted Uses. Each Permitted Use gets its own (duplicate) entry in the Zone District and must be described specifically in the Permitted Use column.

Permitted Use Percent of Zone:
Captures the percentage of each Zone District covered by the specific Permitted Use. All permitted uses within a single Zone District should add to 100%. These percentages are generally the historic pattern of development in mixed use zones.

Minimum Lot Size
Minimum lot size per Zone District as specified in municipal bylaws. This number is given in square feet.

Minimum Lot Area per Unit:
The required square footage per unit. This can be a represented as a formula against the minimum lot size. For instance, if the by-laws allow two dwelling units in a 40,000 square foot lot, this value can be represented in this cell as 20,000 either explicitly or by formula.

Floor to Area Ratio:
Usually specified explicitly in the municipal bylaws. FAR is the permitted fraction of structural floor area to the square footage of the lot on which it is constructed. Cell values should contain two decimal places (0.00)

Road Odd Lot Factor
A fraction that considers the discounting of buildable land resulting from oddly shaped lots and road right of ways. For instance, an odd lot factor of .85 indicates that 15% of buildable land will be eliminated due to inconsistencies of this sort. The default value for odd lot factor is typically .85. Cell values should contain two decimal places (0.00)

Minimum Frontage:
The minimum lot frontage required for lot creation. Typically this value is explicitly listed in the zoning bylaws.

Appendix E: AMHERST BUILD-OUT PARTIAL CONSTRAINTS

The following table describes partial constraints characteristics of the Town of Amherst GIS build-out analysis. These values were established during the constraints development phase of the project in coordination with the Amherst Planning Board and Comprehensive Plan Committee.

Constraint	Fraction buildable when primary constraint	Buildable multiplier when secondary constraint	DevCon column
Wetlands	0.25	0.19	WETLAND_PC
River Protection (200')	0.75	0.56	AMHR_RV_PC
Slopes, Steep (25 +)	0.10	0.08	SL4_PC
Slopes, Moderate (15 - 25)	0.75	0.56	SL3_PC
Planned Unit Development Overlay	1.50	0.75	PURD_PC
Aquifer Recharge Protection Overlay	0.90	0.68	AQU_PRO_PC
Farmland Conservation Overlay	0.90	0.68	AG_PROT_PC
Infill Zones	1.20	0.90	INFILLZ_PC
Not Currently Used:			
Scenic Inventory	0.75	0.50	SCEN_IN_PC
Wellhead Protection Areas	0.75	0.50	IWPA_BU_PC
FEMA Floodplains	0.75	0.50	FEMA_PC

Notes:	
Wetlands:	A small portion of actual Amherst wetlands are mapped; those that are included are heavily discounted
River Protection:	Typical constraints factors
Slopes: Steep	Typical constraints factors
Slopes: Moderate	Typical constraints factors
Planned Unit Development Overlay	
Aquifer Recharge Protection Overlay	Not large impact on buildability: .Acceptable Range: 9 - 1.0
Farmland Conservation Overlay	Not large impact on buildability: .Acceptable Range: 9 - 1.0
Infill Zones	Temporary Placeholder

Flood Prone Conservancy	Although an overlay, not included in this list. Constitutes absolute constraint in entirely of area.

Definitions

Constraint:
Provides a verbal description of the partial constraint.

Fraction buildable when primary constraint:
Defines the percentage of the land under the particular partial constraint that is typically available for new construction when this is the only constraint acting upon it.

Buildable multiplier when secondary constraint:

Defines the percentage buildable when individual partial constraint is secondary to one or more partial constraints occupying a greater percentage of the polygonal area.

DevCon Column:
Key item relating to individual field names in the Amherst DevCon.dbf that define partial constraints for the analysis area. All partial constraints fields are suffixed with _PC; this is the coded standard of the ArcView scenario generator. There MUST BE an entry for every such field in the DevCon dbf file or the Build-out Calculator will not complete processing.

Appendix F: AMHERST BUILD-OUT SUMMARY TOTALS

The following table describes calculated summary totals for the Amherst build-out. The numbers contained in this table represent totals derived for the presentation build-out. AGI/Herr delivered the Amherst build-out with full tools and data to actively tune and modify build-out results to satisfy changing conditions, assumptions or varying scenarios.

BUILD-OUT IMPACTS SUMMARY

Total area (acres)	17,050		
Buildable Land (acres)	4,053		24%
No constraints		1,966	12%
Single partial constraints		1,706	10%
Multiple partial constraints		380	2%
Non-Buildable Land, Water (acres)	12,997		76%
New Residential Lots	3,031		
New Dwelling Units	3,395		
New Residential Subdivision Roads (miles) [1]	34		
New Commercial/Industrial Floor Area (sq. feet)	3,896,815		
Additional Residential Water Use (gallons/day) [2]	662,025		
Additional Commercial/Industrial Water Use (gallons/day) [3]	292,261		
Additional Municipal Solid Waste, Recycled (tons) [4]	2,030		
Additional Municipal Solid Waste, Non-Recycled (tons) [5]	7,591		
Additional Residents [6]	8,827		
Additional Students [7]	1,222		

Notes:

1. Based on the assumption that 40% of the new residential lots will have frontage on new subdivision roads.
2. Based on 75 gallons per day per person.
3. Based on 75 gallons per 1,000 square feet of floor space.
4. Based on 460 lbs per person per year. All waste estimates are for residential uses only.
5. Based on 1720 lbs per person per year.
6. Based on 2.6 persons per household (1990 US Census).
7. Based on 0.36 students per household (1990 US Census).

Appendix G: AMHERST BUILD-OUT EMAIL DISTRIBUTION LIST & LINKS

Distribution List

The following list contains email contact information for core participants from the Town of Amherst Planning Board and Comprehensive Plan Committee who contributed in development of this project.

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Links to Maps and other Web Resources

The large quantity of the maps, tables, presentation materials and intermediate components of the Amherst Build-out and Growth Study may be found at:

http://www.appgeo.com/clients/amherst/

Additionally, all data and software necessary to run the GIS build-out as it was performed by AGI/Herr, and to continue to modify and investigate alternative development patterns will be posted on this site for download.

This site will be hosted at least through the end of 2002 by Applied Geographics, Inc. Materials pertinent to this ongoing process may be added as they become available. Additionally, this report is downloadable from that site in Adobe portable document (PDF) format.